In the Claims

What is claimed is:

1. (Original) A method of MR data acquisition comprising:

prescribing a 3D imaging volume;

applying a pulse sequence that is applicable as a 3D pulse sequence with slice encoding and rewinder gradients disabled in one dimension;

acquiring 2D MR data to localize the 3D imaging volume;

enabling the disabled encoding and rewinder gradients in the pulse sequence;

applying the pulse sequence in three dimensions; and

acquiring 3D MR data of the 3D imaging volume.

2. (Original) The method of claim 1 further comprising the step of modifying the pulse sequence between a 2D pulse sequence and a 3D pulse sequence in real-time and on-the-fly.

3. (Original) The method of claim 1 further comprising the step of allowing adjustment of at least one of an FOV, a slice thickness, flip angle, matrix size, sampling bandwidth, and spatial saturation between real-time data acquisitions.

4. (Original) The method of claim 3 further comprising the step of acquiring full k-space data for one MR data acquisition after an adjustment, and then acquiring partial k-space data thereafter until a subsequent adjustment.

5. (Original) The method of claim 1 wherein the steps of acquiring 2D MR data is sped up by first acquiring one set of complete k-space data, and then acquiring a subset of k-space data thereafter.

6. (Original) The method of claim 1 further comprising the step of detecting object movement during real-time data acquisition and if object movement is detected, acquiring full k-space data for at least one MR data acquisition and acquiring partial k-space data thereafter.

7. (Original) The method of claim 6 wherein the step of detecting is performed by one of an automated detection using a navigator echo technique and manual observation of real-time generated images.

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8. (Original) The method of claim 1 further comprising the step of switching from 2D MR data acquisition to 3D data acquisition within one repetition time (TR).

9. (Original) The method of claim 1 as used in an MRA exam and further comprising:

injecting a contrast agent;

continuously applying the pulse sequence, acquiring 2D MR data, and displaying images in real-time until an arrival of the contrast agent in a monitor station; and then,

switching the pulse sequence to 3D acquisition and acquiring 3D MR data for the prescribed 3D imaging volume.

10. (Original) The method of claim 9 further comprising the step of adaptively switching between a 2D monitor mode and a 3D acquisition mode for each of a number of prescribed 3D imaging volumes.

11. (Original) An MRI apparatus to acquire MR images and switch between 2D and 3D image acquisition in real-time comprising:

a magnetic resonance imaging (MRI) system having a plurality of gradient coils positioned about a bore of a magnet to impress a polarizing magnetic field and an RF transceiver system and an RF switch controlled by a pulse module to transmit RF signals to an RF coil Assembly to acquire MR images; and

a computer programmed to:

modify a pulse sequence upon demand between a 2D pulse sequence and a 3D pulse sequence;

apply the pulse sequence and acquire MR image data in 2D and 3D based on the pulse sequence as modified on demand; and

reconstruct MR images.

12. (Original) The MRI apparatus of claim 11 further comprising a user input to select the modification of the pulse sequence and wherein the modification is made within one repetition time of the pulse sequence.

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13. (Original) The MRI apparatus of claim 11 wherein the pulse sequence is a conventional 3D pulse sequence when in a 3D pulse sequence mode and has the slice encoding and rewinder gradients disabled in a 2D pulse sequence mode.

14. (Original) The MRI apparatus of claim 11 further comprising a user input to adjust at least one of an FOV, a slice thickness, flip angle, matrix size, sampling bandwidth, and spatial saturation between real-time data acquisitions.

15. (Original) The MRI apparatus of claim 14 wherein the computer is further programmed to acquire full k-space for one MR data acquisition after an adjustment, and then acquire partial k-space data thereafter until a subsequent adjustment.

16. (Original) The MRI apparatus of claim 11 wherein the computer is further programmed to detect object movement during real-time data acquisition and if object movement is detected, acquiring full k-space data for at least one MR data acquisition ad acquiring partial k-space data thereafter.

17. (Original) The MRI apparatus of claim 11 wherein the computer is further programmed to accelerate MR image data acquisition by first acquiring one set of complete k-space data, and then acquiring a subset of k-space data thereafter.

18. (Original) A computer program stored on a computer readable storage medium having a set of instructions executable by a computer to cause the computer to:

use a common pulse sequence to acquire MR images in 2D and 3D;

receive an input indicating an operator desire to acquire 2D or 3D images;

if the input is indicative of a desire to acquire 3D images, apply the common pulse sequence with 3D parameters; and

if the input is indicative of a desire to acquire 2D images, apply the common pulse sequence with 2D parameters.

19. (Original) The computer program of claim 18 that further causes the computer to:

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disable parameters in a third dimension in real-time to modify the common pulse sequence to create and apply an effective pulse sequence;

acquire MR data; and

reconstruct an MR image.

20. (Original) The computer program of claim 18 that further causes the computer to accept an input allowing adjustment of at least one of an FOV, a slice thickness, flip angle, matrix size, sampling bandwidth, and spatial saturation between real-time data acquisitions.

21. (Original) The computer program of claim 20 that further causes the computer to acquire full k-space data for one MR data acquisition after an adjustment, and then acquire partial k-space data thereafter until a subsequent adjustment.

22. (Original) The computer program of claim 18 that further causes the computer to detect object movement during real-time data acquisition and if object movement is detected, acquire full k-space data for at least one MR data acquisition and acquire partial k-space data thereafter.

23. (Original) The computer program of claim 19 that further causes the computer to accelerate data acquisition by first acquiring one set of complete k-space data, and then acquire a subset of k-space data thereafter.

24. (Original) The computer program of claim 18 that further causes the computer to convert the common pulse sequence from 3D to 2D within a single repetition time.

25. (Original) A method of acquiring MR images in a 3D MRI study comprising the steps of:

identifying a desired imaging volume;

entering a real-time monitoring mode using a modifiable pulse sequence in a 2D mode;

navigating in real-time by acquiring and monitoring 2D images until the desired imaging volume is sufficiently located;

switching the modifiable pulse sequence from the 2D mode to a 3D mode; and

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acquiring 3D images of the desired imaging volume.

26. (Original) The method of claim 25 wherein the modifiable pulse sequence is switched from one mode to another within a single repetition time.

27. (Original) The method of claim 25 further comprising the steps of:

switching the modifiable pulse sequence from 3D to 2D after imaging the desired imaging volume;

allowing for further navigating; and

switching the modifiable pulse sequence to 3D and acquiring further 3D images.

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